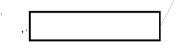# DOS/UNIX Interoperability and E-mail in the Agency

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Editor's Note: This article is a talk given by the author to the T Open Forum on 16 October 1991.

This presentation was developed to help users and managers understand what products are available to help them solve the special problems in today's mixed DOS and UNIX environment. Solutions for both DOS and UNIX are discussed, with an emphasis on solutions that work together to allow users to benefit from the best of both worlds. Various cost-effective alternatives for meeting user requirements are also explored, including increasing the capabilities of existing hardware.

Discussions of UNIX, standards, Graphical User Interfaces, DOS and DOS networks, Network File System (NFS), X, and X terminals are included from both an Agency and industry perspective. Selected products readily available from existing Agency contracts are presented as possible solutions to user requirements, and their integration and functionality are discussed. Commercial products included are Open Desktop, PC TCP Plus, PC NFS, JSB Multiview Desktop, PC XSight, and Office Portfolio.

A discussion on the future and user impact of the Agency's mail and DNS is also included with "survival tips" for end users.

My hope is that each of you will gain a better understanding of what is available from the Agency's contract with Santa Cruz Operation (SCO) and whether any of the products can be beneficial in your environment. I'm not here to try to sell anything, hardware or software, and I'm especially not here to try to convince you to use products that won't meet your needs. But I will challenge each of you to take a hard look at your *real* requirements before you decide on any particular solution.

Requirements are statements of functions and capabilities. Specific hardware and software represent *solutions* to requirements; they are not requirements themselves. We are fortunate today that there are often multiple solutions to our requirements. However, each solution has tradeoffs associated with it that must be considered.

I hope that you will sit back and listen with open minds, and I will try to stress optimizing current resources, integrating products into our existing environment, and trends we should keep in mind for the future.

I'd like to start by looking at UNIX, standards, and Graphical User Interfaces (GUIs) and discuss what they are, why we should care about them, and how we've gotten where we are today in the Agency. Then we'll discuss individual products that put all of this together.

So what is the big deal about UNIX, anyway? The Agency started using UNIX in the 1970s during the reign of proprietary operating systems. Most operating systems are written in assembly language and are built for a particular set of hardware. UNIX is basically written in C, a high-level language; therefore, it offered the hope of being ported to many hardware platforms rather than living its life on a single machine as operating systems usually do.

The Agency has always been very dependent on special software because there are no commercial products to do many of the things we need to do. Our investment in in-house software was tremendous, and Agency planners saw that base increasing. UNIX was seen as an opportunity to develop software once and then use it on many machines, rather than having to rewrite everything for each new system.

I can't say that everything has gone smoothly over the last twenty years of UNIX. Bell Labs made the UNIX source code available to universities and hardware vendors (so it was not proprietary), but everyone started adding things to make theirs better than the next guy's. Because of this, incompatible evolution paths resulted, and things were very messy for a long time. Finally, the mess is clearing up.

Which brings us to standards. Why do we even need them? Basically, because there is not an endless supply of money. In our personal lives we benefit from standards every day. When a headlight burns out on your car, do you go to the manufacturer to buy it? Would you have the manufacturer install it? Would you even purchase a car knowing that you would always have to go back to that one place for all your parts and service? What happens when something goes wrong and he has gone out of business? Scrapping a whole car just because the water pump went bad and couldn't be fixed would not be acceptable to any of us. Standards in the computing world aren't a lot different in principle. We're not completely there yet, but progress is being made.

What do standards give us? They give us choice and flexibility. And when we have choices, we get lower prices because of competition. Standards also give us the ability to change without losing all of our previous investments. Without standards, we lose a lot.

Businesses got tired of being tied to a single vendor with expensive, proprietary solutions for their problems. They wanted the freedom to change from one vendor to another without losing all of their software and training investments and productivity gains they had made to that point. As their organizations grew and technology advanced, they also needed their different proprietary systems to communicate. It was unacceptable for their whole organization to be thrown into chaos just to change to a new vendor or product line. We have seen it in the Agency, too. IBM dropped ATs for the PS/2s, SUN dumped their SUN3 line for the incompatible SUN4/SPARCs, and WANG discontinued the Alliance. In general, we've been pretty lucky. We were able to get clones to meet our need for compatible PCs, and SUN is offering trade-ins to upgrade to the SPARCs. But what if we hadn't been so lucky? We weren't with WANGs, and we're still paying the price by trying to bridge the gaps.

"Open" is all about vendors sharing technologies and agreeing to use common interfaces rather than each one developing competing, proprietary, and incompatible solutions for the same problems. For the consumer, this means we can finally focus more on our requirements and be able to select the best solutions for those requirements from among the various hardware and software vendors offering competing solutions.

So what can we learn from all of this? The only thing any of us can be sure of is change – technology changes almost daily. Probably the best that we can do is to strive to intelligently adapt so that we can preserve our prior investments when it makes sense to do so and never have to start all over again. Progress is spending time and money to develop new capabilities, not spending it to rewrite the same things on different machines. I don't think any of the cryptanalysts in the Agency would ever volunteer to rewrite all of their IMP code into C again – that task in itself did not provide any great functional improvements, but it took a tremendous amount of effort.

We've talked about UNIX and standards so far; now we'll talk about user interfaces and their evolution on PCs. The big hype in the world right now centers on Graphical User Interfaces, or GUIs. Simply put, GUIs are the interface between you and the computer. The graphics part means that you use a mouse and point and click to do things instead of having to rely on some kind of divine intervention to know what to type in on the command line. GUIs can really make the difference between feeling intimidated and feeling confident when using a computer. A lot of users don't want to have to know a lot about computers to do their jobs. What have we seen in the industry?

Apple, with its Macintosh, really led the way in trying to make a computer "for the rest of us." Their goal was for people to be able to use computers productively without having to know anything about how they work. They used a visual interface rather than the regular command line being used by everyone else. They even took things one step further and made the insides of the cabinet inaccessible to users. It was truly meant to be a turnkey system for humans. But there was a problem that was soon acknowledged. Some people wanted to know how things worked and did not like having to go to Apple for all their support and options. Apple eventually opened their architecture so there was a choice for hardware and software. But the biggest factor was that people always loved how easy they were to use. MACs were meant to be like driving a new car: you get in, turn the key, and drive away. All of the controls are there, and you can use them without having to know anything about how the engine works.

Meanwhile, the Intel market was also developing. Intel sold its CHIP to other hardware manufacturers, who produced the final consumer product. Prices came down because of this competition, and it was widely accepted by consumers. DOS was reasonably easy to understand and inexpensive enough for the not-so-rich consumer. Software and hardware were widely available. The DOS PCs weren't as easy to use as the MACs with their graphical interface, but users didn't mind too much because of the wide variety of applications available at a low cost. From a user's perspective, DOS PCs are like driving a car with a stick shift for the first time. After spending a little time figuring out how it works, what to do with the extra hardware, and when to push what, you finally get

oriented and can be on your way – the ride may be rough for a while but things smooth out with practice. Since then, MS Windows has provided a GUI for the DOS world, and it has had remarkable success in the short time it's been available.

The Intel platform has become so entrenched by the sheer number of installed systems that one of today's biggest challenges is to find smart ways to protect that investment. The Intel processor has evolved to a performance standard that isn't limited to serving a single user anymore. The power of the processor in that AT sitting on your desk that everyone is trying to replace exceeds that of the PDP 11/70 processor. If you remember, the PDPs commonly supported twenty to thirty users simultaneously, and some have over two hundred user accounts on them. The SCOPE 2000 processor can outperform the ASH 3B5, 15, and 20. A 486 may very well outperform the SUN 3s. Of course, there is a lot of difference when you consider the I/O capabilities of those hosts, but it is pretty impressive to consider that this past August was only the tenth anniversary of the introduction of the IBM PC.

Since the PCs have become considerably more powerful, they are now able to handle more demanding software, such as GUIs and UNIX. UNIX is now able to be loaded on an Intel-based machine – not a precursor or subset like PC/IX or XENIX but all of UNIX. Unfortunately, from a user's perspective, UNIX has been like buying parts and trying to build a Toyota from scratch by using the ton of documentation provided. All of the information you'd ever need is there, but you wouldn't want to bet on being able to drive it to work the next day. But hope is on the way for UNIX, too. Today's powerful PC processors are also able to support UNIX GUIs. Even if they can't make UNIX downright "friendly," at least they will make it more usable for those people who "just want to get their job done."

Now let's turn our attention to Open Desktop, which combines UNIX, standards and a GUI into one product and is available on the Agency's contract with Santa Cruz Operation. Open Desktop is a bundled product for 386-based PCs, and it provides a graphical interface to the UNIX system. In addition to the X-based GUI, it also includes the UNIX operating system and utilities, TCP/IP networking, the Ingres database, and DOS emulation. So what can this do for you?

First of all, it gives you multiuser and multiprogramming capabilities on your desktop PC. A few nice features of the SCO product are a menu-driven package called "custom," which allows easy installment of software; a choice between the C shell, the Korn shell, and the Bourne shell environments; and a powerful menu-driven system administration tool. This tool provides system administrators with an easy way to manage such things as user accounts and printers, configure systems, check on system status, and so forth. You don't have to know which files to edit to add users or what the command is to save files to floppies. It's all menu driven and easy to use.

So now we have UNIX. Being really into operating systems alone does not really do much, does it? Let's add networking and it starts to get more useful. With only ODT loaded, connectivity with any other TCP/IP system is a snap – all the software you need is

included. TCP/IP, a de facto industry standard, is widely used throughout the Agency and is the basis of CLOVER. This connectivity allows you to remotely log on to other machines using telnet or rlogin, transfer files between machines using ftp or rcp, execute commands on other machines or share a resource such as a printer, and send and receive mail messages directly from your 386 rather than using a host.

ODT also includes the Network File System (NFS) protocol for supporting a distributed file system. Using this feature, you are able to share files with other UNIX systems using NFS; for us at the Agency, this means other systems running SCO UNIX and the SUNs. With NFS you don't have to log on the other machine, and the fact that you are using a file that is actually located on another system is completely transparent. You can use your processor to run a program, but the program and data may be located on another system. This is a great way to effectively increase the disk space on your system or centralize system administration by having everyone's home directory in one place for easy backups. Yes, I said backups, the thing that most of us are not very good at doing on our individual systems!

A25 is using NFS extensively with their SCOPE 1000s because of the 80-mb disk limitation. Basically, they have off-loaded as much common software and as many files as possible to server systems and are mounting those files to each SCOPE 1000 using SCO's NFS. Performance has not been degraded by this setup, and each user has approximately 20 mb on his SCOPE 1000 for personal applications and files.

ODT also includes the Ingres database. For those users who need the power of a relational database such as Ingres, this would be an inexpensive avenue worth exploring. Ingres 6.2 is currently included with ODT. T332, the Ingres support shop, has tested Ingres on SCOPE 2000s and found it to provide acceptable capabilities and performance. One word to the wise planner: Applications by Forms (ABF) is a fourth-generation language (4GL) that provides a great environment for database applications development and is widely used in the Agency by Ingres developers. This package is available for SCO, but it must be purchased directly from Ingres.

DOS Merge allows DOS commands and programs to be executed from UNIX, instead of having to reboot between separate UNIX and DOS partitions. DOS applications can be installed and run without modification. However, not all DOS programs will work. This is because DOS merge is an emulator, and all DOS emulators use Intel's Virtual 86 mode. This means that the DOS application uses one part of the processor while UNIX uses the rest.

This "virtual 86" mode is used to refer to the XTs (also called "real mode" in a lot of the SCO literature). The 80286 is the AT ("standard mode" is sometimes used to refer to it) and the 80386 mode may be called "native" or "enhanced."

In the past, almost any DOS application for the AT also worked on the XTs. This means that almost any of this DOS software would work with DOS Merge because these applications don't use any of the AT-specific features. But DOS applications are starting to use the additional features of the newer processors. If a program requires a 286 or a 386

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processor, you probably will not be satisfied using it with DOS Merge. Most MS Windows 3.0 applications will fall into this category since they are now being designed to use the additional capabilities of the 386.

In addition, certain programs that are not "well-behaved" are not functional with DOS Merge. "Well-behaved" means that the program follows Microsoft's guidelines for handling interrupts. One example of this problem in the Agency is the WANG's driver for the WLOCK card for DOS systems. This card allows DOS users to access the WANG Alliances. WANG's driver does not conform to Microsoft's guidelines, and it uses interrupts that interfere with UNIX. WANG and SCO have both investigated the problem, and WANG has no plans to make any changes. So, unfortunately, this driver will never work with DOS Merge.

All emulators are resource-intensive, and performance can become an issue without proper planning. DOS Merge allows each DOS application's environment to be tailored as far as the amount of memory reserved for it, and proper tailoring can greatly impact performance when you run simultaneous DOS applications. In general, two or three DOS applications should run on a system with 8-mb RAM without degrading performance. DOS Merge is a solution well worth considering if you want to take advantage of the power and flexibility of UNIX, but you still have a few DOS programs that you cannot live without.

By the way, when you purchase SCO ODT, you get a DOS 3.3 license for your system. So if you have a separate DOS partition for programs that won't run with DOS Merge, you do not have to purchase a separate DOS license. DOS Merge will allow you to access DOS 3.3 files on that separate DOS partition, but it does not currently support DOS 4 or 5 partitions.

But support for DOS 5.0 is coming. The new ODT scheduled for release next summer will allow ODT and DOS 5.0 partitions to exist on the same hard disk. Right now, ODT won't boot if you have a DOS partition larger than 32 mb at the beginning of your hard disk. The ability to access DOS 5 files on a separate partition and basing DOS Merge on DOS 5.0 are under development and will be added later.

So far, we've discussed UNIX, networking, Ingres, and DOS merge in ODT. None of this has been graphical at all. Each of these may be accessed using the normal, intimidating UNIX command line. The element that ties all of this together and makes ODT a graphical operating system is ODT-VIEW.

We've talked about standards, and now we'll see an example of where the industry still has some problems. There are two competing GUI standards: Motif and Open Look. Open Look is a joint effort primarily between SUN and AT&T. Motif is a joint effort between IBM, HP, DEC, and everyone else. The differences between Motif and Open Look basically lie in what the window border looks like and in how you do things like maximize and minimize or open and close the windows on your display. The bottom line is that both Motif and Open Look provide the same basic functionality and serve the same purpose, so it all

comes down to personal preference. Most developers seem to be using Motif, so some predict that it will "win."

One critical element of a GUI is the desktop manager. Whereas Motif determined how the Windows work, the desktop manager lets you access your files and programs graphically and determines how such things as drags and drops will work and how to customize the icons on your desktop. MacIntosh and SUN both package the manager with their interface, but Motif did not specify a desktop manager (and there are many to choose from).

The desktop manager used by ODT is actually IXI Limited's X.desktop, and *UNIX World* recently rated it as one of the best Motif-based Desktop Managers. They felt that it best adhered to the Motif standard, and it has been certified as Motif compliant. This provides a Graphical User Interface to UNIX and everything else in ODT, which means that a user is able to do everything with his files and programs by pointing and clicking on pictures rather than having to know what UNIX command to type in on the blank command line. Graphical access to all the regular commands and directories of UNIX are included as well as any applications on the system.

Another feature of the SCO product that I have found very useful is the multiscreen capability. Basically, you have the ability to have twelve login sessions going at once from your single monitor and keyboard. This means that you can just press the Alt key and F1 through F12 to switch to a different session. You can login there and do anything that you can do from the initial login when you boot the machine. For instance, if I need to format a disk, I might switch to another multiscreen and login as root and start the format. While it's doing that, I go back to my other multiscreen where I have ODT and SANDTERM running. If a user has a problem and I need to login to another machine, I can go to a third multiscreen to telnet to that machine. I may have Office Portfolio (OP) running in a fourth multiscreen. It is really nice to be able to switch to a totally different session sometimes, rather than interrupting your screen by opening a new window to do something totally unrelated to everything else.

Many people want to use only commercial software. That has certainly been our corporate direction, but I want to briefly mention one word about SANDTERM. Sometimes there are products developed in the Agency that will never have commercial equivalents. For instance, SANDTERM is an Agency-developed product that offers a lot of functions that are commercially available, but it provides specialized connectivity unique for our environment. It allows you to connect your SCO workstation to files and processes on CARILLON, WINDMILL, PLATFORM I hosts, PLATFORM II hosts, PDP 11/70s, ASHes, other SCOPEs on CLOVER, etc. SANDTERM is fully compatible and functional with ODT, and it provides features that can greatly enhance communications between our diverse systems.

We've covered a lot of ground here with the packages and capabilities included with ODT. The setup of a system for real user friendliness is not a trivial task. ODT is used by many contractors and resellers as the basis for building specialized and customized interfaces for users. Nobody in the commercial world takes ODT out of the box and installs

it and expects it to do everything he or she wants. Organizations in the Agency are using this product to customize interfaces for their users as well. They are working to allow their users to have access to the full file system and commands that UNIX offers without being experienced UNIX users. The key here is customizations for inexperienced users: this is critical because the typical end user is not going to be able to do his own customization. ☐ has implemented a customized Office Automation package for T5 managers, and ☐ is working on a customized interface for their analysts.

Remember the Toyota we talked about earlier? When all the parts are put together correctly, most people agree that Toyotas are reliable, low-maintenance products that will last for a long time. You can have the same with UNIX and ODT: with the proper care and handling, all the pieces can be put together to produce a powerful, productive interface for end users.

Now let's turn our attention to DOS and UNIX interoperability. More and more networking solutions are becoming available for the DOS world. Many offer capabilities that have been part of UNIX all along. Others are workarounds to allow DOS users to tap into UNIX resources.

DOS server networks are all proprietary and use an entirely separate Network Operating System to control shared resources, such as files and printers, because DOS just isn't equipped to do so. Vendors that compete in providing these proprietary solutions are Novell (NetWare), Banyan (VINES), and Microsoft (LAN Manager). If you are not using one of these packages and think your DOS machine is working just fine and that UNIX is just too hard to use, you're not making a fair comparison because your DOS machine without a Network Operating System does not support the same complex capabilities that the UNIX system provides. These Network Operating Systems allow multiple users to access common resources. A dedicated DOS server machine is required to provide the shared resources to the single user DOS systems. DOS networks are complex; they're not a snap to set up or to maintain. A DOS network needs an experienced administrator; UNIX requires no less.

The difference seems to lie in our perceptions of our environments. A DOS environment centralizes its shared services into one server machine. DOS LANs have an administrator, just as organizations have system administrators for their PDPs and ASHes. But for some reason we continue to ignore the support requirements of the PCs on people's desks. They're not just terminals anymore. Remember, those SCOPE 2000 machines have full-blown UNIX on them now. Each workstation has all the capabilities that the DOS server has and more. There are system administration requirements that need to be addressed; users should not be expected to administer that UNIX system any more than you should be expected to administer an ASH or Alliance just because you use it. Organizations need to recognize this requirement and centralize administration so that experienced people are supporting multiple users. Organizations that have committed to this have greatly increased their users' productivity and decreased their users' frustration.

DOS and UNIX each have a lot to offer. The best thing for users is to provide the best of *both* worlds: the DOS applications that they are already familiar with and the specialized or powerful applications available on UNIX machines. We are in a world with many requirements, and we have a lot of people with different experience levels and personal preferences. The Agency has large investments in many diverse and incompatible solutions that have already been implemented. That investment should be preserved whenever it makes sense. So how can they work together? The good news is that there are a number of commercial packages that allow DOS users to access UNIX resources.

One solution in use is a product from FTP called PC/TCP Plus. This software allows individual DOS workstations to connect with a TCP/IP network and provides ftp, telnet, and remote commands. This solution applies to DOS users with an ASTW or a SCOPE who need occasional connectivity to text-based applications on UNIX systems (for example: mail, bulletin boards, or applications such as Office Portfolio from a 386 machine, or Q Office from a Sun server). When this program is in operation, all other processing on an ASTW is suspended and the screen is dedicated to PC/TCP. Access to the remote system is from the UNIX command line.

NFS capabilities are also included. NFS allows users to transparently access files that are physically located on a UNIX system from their DOS machine. Users can continue using their DOS applications but have their personal files actually (and transparently) located on a UNIX server somewhere. The DOS programs actually run on the local DOS machine, but all the data are on the more secure UNIX host. If someone happens to turn on the DOS machine, nothing is there to be accessed. The UNIX machine gives you a DOS file server without using one of the proprietary Network Operating Systems.

PC/TCP Plus offers an opportunity to extend the usefulness of our XTs and ATs. It is a nice connectivity solution for DOS machines to use text-based UNIX applications. PC/TCP Plus is available off a site license with FTP through T331 at no charge.

PC/NFS is a competitor of PC/TCP and is available on the HPW contract, which expires June 1992. Its price is $250–$300. Most agree that PC/NFS is easier to load, but it's less flexible than PC/TCP. If, on the other hand, you are fortunate enough to have a 386 and you're using DOS and Windows but need access to UNIX applications, JSB Multiview Desktop may provide a solution for you. From the user's perspective, you can use your normal DOS applications from MS Windows, but when you need to use a UNIX application, you can just click on an icon and watch a new window appear with the UNIX application. The application is actually running on a UNIX machine somewhere, but that does not affect you at all.

For instance, you could be writing a memo using your favorite DOS word processor in one window and decide to send mail to someone. All you need to do is click on an icon and, for instance, a window with Office Portfolio mail appears. You can finish your message and close that window and then continue working on your memo. You don't have to invoke any network software package, or login to the UNIX host, or start the mail command on

the remote system, or be aware of any of the machine intercommunications required; you don't even have to know that the application isn't on your machine. All of the same window manager features, including pull-down menus, cut and paste, and mouse functionality, also work with the UNIX Window.

One of the strengths of JSB is its ability to run up to six applications on an SCO HOST using a single network connection. This effectively gives UNIX multiprogramming to the DOS user by having multiple remote UNIX applications running simultaneously. Other networking packages allow simultaneous applications to be run, but each one uses a separate connection, and that uses a considerable amount of DOS resources and kills performance. PC/TCP Plus also plans to have a similar feature in a future release. JSB is a great product for DOS with MS Windows users who don't know anything about UNIX and don't want to learn about it but need to run UNIX applications.

The biggest drawback of JSB right now is that it supports only text applications. An X version is currently in Beta test and will be available next year. When the X version is available, DOS/Windows users will be able to access UNIX X applications such as FRAMEMAKER or OILSTOCK from their DOS/Windows environment.

JSB Multiview Desktop is available off the SCO contract, and the price is about $100 for a one-user license and up to about $650 for a ten-user license. The licenses are for simultaneous JSB users accessing the SCO server.

Another opportunity to get more from your ASTW is in terms of X terminals. First, I'll give you some background.

X is a portable, network-transparent window system that was developed and trademarked by MIT. It is available from MIT at no cost and has become the standard for graphics applications development. X runs on a variety of hardware platforms and operating systems, including SUN, Apollo, DEC, our SCOPE 2000s, and many others. The terminology can be confusing, since there are so many terms used for it. X, X11, X Window system, and X version 11 are all synonymous. X is actually a standard set of library functions that controls the graphics and communications of the computer where it resides and transparently services the user and the application process. When someone says an application program is X-based, he/she means that it uses these X11 library routines developed by MIT. In practical terms, it means that the program's output may be displayed on other systems.

The X client-server relationship is also confusing. Servers provide some resource, such as a file server or a mail server, and it's usually from some other machine. In X, the resource being provided is the user's display. The server is actually a program that runs on the local user system, controlling the screen, keyboard, and mouse, and allowing a remote X application to open and close windows on that screen. So the user's system is called the server, and the remote application program is the client. The application program may actually be running on the same machine or on another machine on the network. In either case, the application uses the X server to display its output and to get keystrokes and mouse clicks from the user. If all of this is still confusing to you, you can

just think of clients and servers the way you are used to and then reverse everything when you're talking about X.

The X protocol is demanding of hardware: it needs adequate processing power to handle the window manipulation, large screens with high resolutions to support the graphical displays, built-in networking, and special software to handle the X Windows. High-performance workstations have been able to handle the X requirements for a while, and commercial packages such as FRAMEMAKER and internal X applications such as OILSTOCK and TINTYPE are common on HPWs. But, as we all know, HPWs are fairly expensive.

Around 1988, the X terminal concept started to develop as a way for more users to use X applications without having to purchase expensive workstations for each person. They were specifically designed to meet these hardware requirements to support X. They typically have a keyboard, a mouse, a high-resolution monitor, and a control unit that has built-in networking and special display software, 1–4 mb memory, and a microprocessor to put it all together. They don't have an operating system, disk drives, or peripherals, and they cost between $2,000 and $6,000, depending on the amount of memory and whether you have a monochrome or color monitor. Since then, commercial X terminals have been gaining a larger part of the workstation marketplace as a way to provide a more cost-effective way for more people to use X applications.

But many commercial companies are looking at using their existing PCs as an even lower-cost alternative to purchasing X terminals. More and more people feel that running X Windows on a PC makes a lot of sense for those who use X only occasionally. Some see it as only an interim solution until they upgrade their systems, and others see it as as a way to extend the life and functionality of the PCs. So how can we use this in the Agency?

SCO offers a product called PC XSight, which transforms a PC into an X terminal. This would allow us to take an ASTW running DOS, PC/TCP, and PC XSight and connect it as an X terminal to a SUN or a SCOPE 2000. The application programs actually run on the more powerful SUN or SCOPE system, but the user interacts with the program just as if it were running on his ASTW. Remember, the X server program handles the graphics display to the user's screen and automatically provides keystrokes and mouse clicks back to the X application program.

There are varying opinions about using PCs as X terminals, but T3 tested the Agency's X application, OILSTOCK, and its performance on an ASTW was found to be perfectly acceptable for analysts' use. A SANDTERM-configured ASTW was used for this test – that means an 8-MHZ AT with 3-mb RAM and an EGA monitor; a mouse had to be added. Remember, the resolution is EGA, not VGA, so you will notice a difference.

You could also run SANDTERM itself as an application this way – remember, your ASTW is running DOS with the X server software not XENIX. Other possible applications include FRAMEMAKER, ODT, and X-based versions of database packages such as Ingres or Cybase. I have mentioned FRAMEMAKER so often because it is already so widely used on the HPWs in the Agency. Remember that you need the X-based version;

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SUNview does not support remote display of output, so it's unusable in this environment. A multiuser X version of FRAMEMAKER is available to run on the SCOPE 2000s if you do not already have SUN licenses. It must be purchased directly from Frame. To my knowledge, OILSTOCK is the only package mentioned that has been tested, but it is a very graphics-intensive application, and it should be a reasonable performance indicator for using the ASTW as an X terminal. The performance limitation is with the user's terminal and its ability to handle the networking and the manipulation of whatever windows are being used. Remember, DOS is loaded on the ASTW, so the user can also use any DOS applications on his system when he is not using the system as an X terminal. He will not be able to run local DOS applications and remote X applications simultaneously.

PC XSight is available from SCO as a separate package and costs about $150/DOS machine. If you need to run X applications, the ASTW X terminal option is definitely worth exploring as a low-cost alternative.

I have mainly discussed reusing the ASTW ATs as X terminals here because this solution provides an opportunity to enhance the ASTW's current capabilities. 386s and 486s can also be used as X terminals, and their faster processors provide better window handling; but running DOS and PC/TCP and PC XSight offers less than what you get running ODT alone. So, if you have a 386 system and your primary requirement is to run X applications, loading ODT on your 386 makes more sense.

If all of this transparency and easy user interface sounds like a repeat of JSB Multiview Desktop, it's because they both offer transparent access to remote UNIX applications from windowed environments. The differences lie in where the GUI is running and what type of UNIX applications may be run. Both are running DOS on the local system. With JSB, MS Windows provides the GUI and runs on local system; with XSight, the X application provides the GUI and runs on the remote system. JSB runs on top of MS Windows, so it really needs a 386; PC XSight can be run on an ASTW or SCOPE. Right now, you can run only UNIX text applications with JSB, and you can run X applications using XSight. However, when the X version of JSB is released, both will provide access to X applications. Once JSB offers this X support, DOS users with 386s should use JSB; UNIX users with 386s should use ODT; and ASTW users can still use PC XSight to run X programs.

Office Portfolio is a character-based "workgroup productivity manager" and is available on the site license. Basically, it's an office automation package and includes calendaring, a name directory, a basic text editor, and mail. Office Portfolio is all character based and menu driven and is really straightforward to use. As I have said before, it can be accessed using icons from ODT if you need a graphical interface.

We'll talk about the calendar first. On a personal level, the calendar provides a very intuitive way to schedule events. It has all the normal fields for events and allows repetitive scheduling, such as weekly staff meetings. Other features include viewing your schedule a day, a week, or a month at a time, searching for blocks of free time, and automatic reminders, which puts a note on your screen a few minutes before the event.

Calendars may also be set up for resources such as conference rooms and equipment so people can handle their own scheduling, and it's centralized.

Another powerful aspect of the Office Portfolio calendar is the ability to network individual calendars to allow automatic coordination and scheduling among a group of users. In this case, one system is designated as the calendar server for a group of client systems. When you need to schedule a meeting and specify the attendees, each calendar involved is queried and conflicts are reported back. Once the final meeting has been set, the system may be configured to automatically add the event to each person's calendar or automatically send mail to each person involved. Each user can choose to allow others to add or delete events to his/her calendar, and he/she can mark events as private so others will know he/she is not available, but they won't know why. There are many options available along these lines to provide a balance between privacy, security, and convenience. The networked calendar supports users known by a common Office Portfolio calendar server; this is usually within a collocated organization, but remote logins could also provide access for others outside the office. Networked calendars are not available on many of the other commercial Office Automation (OA) packages.

The name directory is basically an on-line rolodex. Some nice features include searching; sorting entries by name, organization, or login id; and printing – just to name a few. Other features provided with the OP Manager include being able to move information between applications and access files and directories, kill programs and customize your environment using menus instead of the command line. Hotkeys allow users to switch between programs, for instance, from reading mail to adding something to a calendar without first exiting the mail program.

Office Portfolio's mail provides a menu for all the normal mail functions, and it has extra utilities for such things as searching headers for a certain subject, setting up alias lists, and logically grouping mail into folders. The Office Portfolio mail is easy to use, many feel that it is much more versatile than WANG mail, and it is functional and compatible with the current efforts underway for the Agency's mail. We'll discuss more about the Agency's mail shortly.

I'm just going to briefly mention two functions that Office Portfolio does not provide: the ability to track actions and the availability of on-line forms. Action tracking is controlled by a simple database on the WANGs, and a simple database package such as FOXBASE may provide the basis for a solution and give much more potential. T5 is looking at solutions for action and correspondence tracking that will interface with OP. The second problem is the availability of forms. The Agency paid contractors to automate many frequently used forms for WANG and Q Office, and administrative personnel have found them very useful. I am not aware of plans to have these forms added to Office Portfolio, but the most commonly used forms are available with FRAMEMAKER and can be accessed using SCO products.

There are three SCO applications that are no longer bundled with the Office Portfolio Manager. They are the Lyrix word processor, Professional spreadsheet, and Integra

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database. SCO has decided to concentrate on operating systems products and interfaces rather than applications such as these, so these three products will not have new features added in the future. However, they are very usable products and will continue to be available when you enroll a system in the site license. Unless you have requirements that need the latest functions of a certain product, the word processor and spreadsheet may meet your requirements for years to come. Office Portfolio Manager is a totally separate product from these, and development will continue for it. Lyrix, Professional, and Integra will continue to be functional with future releases of Office Portfolio Manager.

Currently, there are two efforts under way in T that are addressing Office Automation. [____] is working on a prototype of a heterogeneous environment in DDT. It consists of SUNs, DOS machines, and SCOPEs running SCO UNIX. The effort has concentrated on mail (including attaching documents), interfacing to the Agency-wide Domain Name Service, and using forms on FRAMEMAKER. In addition [____] has customized an OA system using ODT and Office Portfolio and has implemented it in the organization. [____] will combine these and other efforts to provide OA solutions for Agency users.

OP won't solve all of our OA problems today any more than any other single solution. But it is a cost-effective alternative being used within the Agency, and it is worth serious consideration.

Now to the mail issue. As we are all aware, sending and receiving mail throughout the Agency has been achievable only with varying degrees of difficulty and success depending on who wanted to exchange messages and where each person was located. The solution to this problem is not an easy one in any way. The objective seems so simple, doesn't it? From a user's perspective, it's easy to understand the frustration: all he wants to do is send a message to someone! How difficult can that possibly be in today's technologically advanced society? But from a technical perspective, it is very complex because of the total incompatibility between the old mail systems.

There have been at least five versions of mail widely used in the Agency. They have been largely incompatible because they were either in-house packages such as PWB or SEMESTER mail on UNIX machines, proprietary packages such as PROFs and COMET on the IBM machines and WANG mail on the Alliances. Each of the versions provided mail services *within* the same mail system, but there was no way to send and receive messages *between* the different mail systems.

There were no commercial products available that bridged our particular mail systems, so the Agency decided to develop its own software. The software package is called NETMAIL, and it runs on an IBM system called OASIS. It successfully connected IBM PROF mail users, IBM COMET mail users, and UNIX PWB/SEMESTER/SANDLOT mail users. WANG presented special problems, so all WANG mail is forwarded to a single WANG system before going to OASIS to get to non-WANG destinations.

The next step is to standardize on a common mail protocol. Simple Mail Transfer Protocol (SMTP) is the de facto industry standard for mail. Products using SMTP are currently available. SMTP is widely used, and it is required to be provided with any

TCP/IP implementation. The final phase will be to standardize using the government-mandated standard for networking GOSIP, which includes the X.400 mail services protocol. It would be best to just skip the TCP/IP and SMTP step, but the reality is that we must wait for the GOSIP standard to be completed and for GOSIP products to be developed and become commercially available at a reasonable cost; the TCP/IP-based CLOVER network provides a solid foundation for implementing SMTP now. Standardizing with TCP/IP and SMTP should provide a good foundation for the future conversion to GOSIP. So that gives us an idea of where we came from and where we're going, but how is it going to affect us?

We have spent a tremendous amount of time and effort dealing with all the problems posed by these incompatible systems, but they are all finally able to communicate. The basic goal is to provide mail service to all Agency users without the users having to worry about how it is being done. Standardizing with a common protocol throughout the Agency will accomplish that. The SMTP standard for mail is fairly new to the Agency, and that has been the latest addition to the Agency mail scheme and to NETMAIL. SMTP is used by ODT and Office Portfolio mail on SCO UNIX systems when you receive mail directly at your system. The following discussion applies to the interface between the old mail systems and the new SMTP mail.

Users still need to know certain information in order to send mail: the recipient's sid, where the recipient receives mail, and how to address the message. These problems have been addressed by the NUAD database on [ ]. This special database was also designed and written by the Agency to provide an extremely fast look-up for user information. You must first register to receive your official, unique Agency sid. After you have received your official sid, you may add your own user information to the NUAD database. Part of your NUAD entry will be your "preferred host," which is where you want to receive your mail. This is either the name of the host you log into for your mail or a special designator if you choose to receive your mail at your local workstation running SMTP. Your system or LAN administrator can give you the proper information if you are using SMTP. Both the sid registration and the NUAD entry may be done electronically. You can use NUAD to find the sid and preferred host of any other user who has entered his/her information into the database. So now you can find out someone's middle initial and mail destination when you want to send mail to him/her after he/she has already gone home for the day.

Unfortunately, you still may not have enough information to ensure proper delivery. You must also know what mail system you are using and how to tell what mail system your recipient is using so you can address the message correctly. If you don't address it correctly, you will get a message back telling you it can't be delivered. You can tell the difference between the mail systems by the format of the "preferred host" entry in NUAD. If it just looks like a plain system name, it is using one of the old mail systems. If it has dots in it, that is a domain name, and it means the recipients are using SMTP.

Now you have all the information you need to successfully send mail, so let's put it all together to send a message.

Case 1: If you are using an old mail system and your recipient is using an old mail system, address your message to <sid>@systemname just like you're used to doing. The host systems know whether or not the message needs to go through the OASIS gateway to the final destination.

Case 2: If you are using an old mail system and your recipient is using SMTP (meaning his NUAD "preferred host" has dots in it), address the message to <sid>@nsa. In this case, you must use the NETMAIL gateway on OASIS to get the message from your old mail system to an SMTP mail system.

Case 3: If you are using SMTP and your recipient is using an old mail system, again use the NETMAIL gateway, so you address your message to <sid>@nsa.

Case 4: If you are using SMTP and your recipient is using SMTP, address the message using the domain name of the recipient. You do not need to go through the NETMAIL gateway because both of you are using a common mail system, SMTP.

SMTP mail systems allow aliasing, so the addressing does not have to be as bad as it looks. There are various utilities to access NUAD and assist you in building your personal alias file on your SMTP workstation. The utilities help Office Portfolio, Q Office, ODT mail, and other standard SMTP users. It will be available by December. After you have set up your aliases, you could use an address as simple as "nancy" when you are actually addressing your message, and the computer will automatically translate that to the proper sid and domain name and send it on to its destination. You can also create group aliases, so that you can address a message to "chiefs," for instance, and have it go to all of the work center or division chiefs.

UNIX systems running SMTP mail include SCOPEs running SCO UNIX and SUNs. Before you are able to use SMTP mail as I just described, your system must be set up to run mail and DNS. Your office system administrator should be able to help you; individual users should not be expected to do this. Detailed instructions are available for configuring systems, and DNS implementation throughout the Agency is just beginning.

Don't panic. Remember, you may still choose to receive your mail from one of the old mail systems rather than set up your individual workstation with SMTP. The difference is whether you receive your mail directly at your PC or SUN or have to login to an IBM, an ASH, a WANG, or some other host. If you choose to continue using a host, you do not have to worry about SMTP or DNS; the system administrator of the host will take care of everything for you.

Domain Name Service (DNS) is the only practical way for the multitude of SMTP users to send messages to each other throughout the Agency. It's also the only way for SMTP users to use NETMAIL to send mail to the other mail systems. You can send and receive mail to other SMTP users without DNS, but you basically need to have table entries for each person you want to exchange mail with. Adding entries to this table and keeping them all up to date is a nightmare. DNS solves this problem for you. If you want

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to set up your local system with SMTP and DNS, there are DNS briefings being given where you can learn all about it.

Please remember one thing in mail addressing: don't use ".@nsa" unless you know you must go through [   ] is still a single point of failure, and if it's flooded by a lot of messages that do not require its services, it can become a bottleneck. NETMAIL does not have to be involved in any mail between users using the same mail system. It may seem like an easy way out, but please do your part and use the NUAD database utilities to look-up sids and preferred hosts.

I'll quickly mention just a few things about the SCO contract since the ordering guide explains the details and is available in the MRC. The term "site license" is really a misnomer. We have a contract with Santa Cruz Operation that allows us to purchase rights to use for individual systems in the Agency.

Each right to use costs the Agency $540 and a $30 annual maintenance fee. This single price entitles you to use any of the products in "CLIN 1," which includes Open Desktop and Office Portfolio that I have discussed, as well as the development system for ODT. Free upgrades for these products are also included until September 1994, when the contract expires.

Once a system is enrolled for the SCO software, that system is able to add any CLIN 1 product without additional charge. The Agency must keep strict records of what software is loaded on each enrolled system to ensure copyright laws are not violated. So each system must be enrolled, and then each package must be registered before it is loaded. Documentation must also be accounted for. If your system has been registered for ODT, you receive all of the software for each of the products included in the bundle, but you receive the manuals only for ODT. If the on-line UNIX documentation is not enough, for instance, and you need the hardcopy UNIX documentation, you must also register that system for UNIX. Then you will be able to get the additional UNIX documentation. The Agency is reproducing the documentation, so we urge people to take only what they really need. T purchased about 1,400 rights to use when the contract was first signed, and these are available to T users on a first-come, first-served basis; about 600 licenses are still available.

CLIN 3 items are other products sold by SCO, and you may use the contract to easily purchase those products, but upgrades are not included. Once you purchase the product, you must pay for any subsequent upgrades just as you would for any other software product. Our price for CLIN 3 items is 63 percent off the normal retail price. JSB Multiview Desktop and PC XSight may be purchased using CLIN 3.

Ordering information for all of this is available through the MRC.

So what can we expect to see in the future? Standards are becoming a bigger part of our life in the government, and they will continue to grow. These are the main standards that are impacting on us and will continue to do so.

OPERATING SYSTEMS	POSIX (iBCS)
Network	OSI/GOSIP
User Interface	X Windows
Languages	C, FORTRAN, ADA
Database	SQL

Commercial products for these standards are basically all available, except for GOSIP, and we're already starting to see the impact. Most of the large government contracts since the late 1980s have required POSIX-compliant operating systems. Because of this and the newer Intel processors, UNIX is making large inroads into the PC marketplace, and DOS is losing ground. Projections are being made that by the end of the decade, the government will be predominantly a UNIX user – 50 percent of the outlays are now going to UNIX; just a few years ago, it was almost nothing. More and more applications are being ported to UNIX as the demand grows. UNIX users should finally begin to benefit from the same price competition that DOS users have enjoyed for so long. The next step iBCS: Intel 386 Binary Compatibility Standard. POSIX gives us source code compatibility between UNIX systems. iBCS will give us binary compatibility: shrink-wrapped UNIX applications that can be used on different hardware. This is what made DOS applications so successful.

Then there's networking and GOSIP. As I have said, this is the government-mandated standard, and commercial products are not widely available yet, but many experts agree that DOS PCs may never be able to use it because the protocol stack is just too large to be handled in DOS's limited program memory.

The other big standard to have an impact on us is X. Most development in the Agency is being done using UNIX and is based on the X Windows standard.
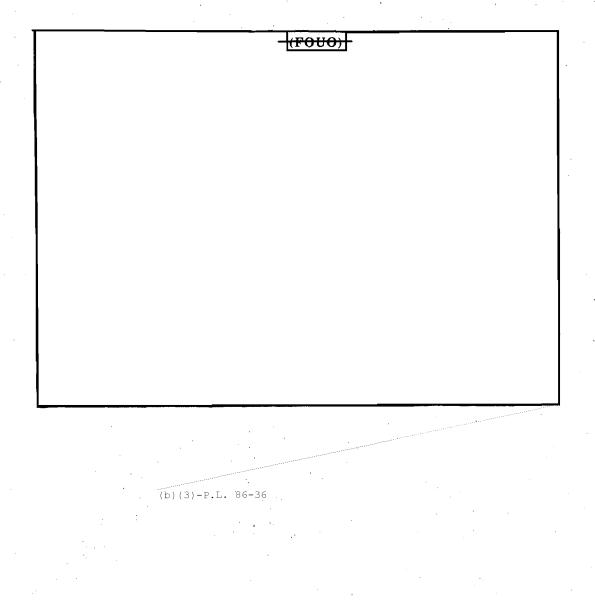
As you can see, we are already being impacted by these standards, and UNIX has the power and flexibility to be the basis for their implementation. DOS does not, and DOS users will have to continue to find ways to tap UNIX resources if they want to take advantage of the newest Agency development and services.

But every user in the Agency should not have to worry about how to do all of this on his individual PC. Whether he chooses a DOS solution or a UNIX solution, and whether he chooses SCOPEs or HPWs or FOCUS machines or mainframes, integration and interconnectivity are not simple issues. Users should be free to use computers and know where to go for help – they need to have system administrators. Without that help, people waste far too much time servicing "computer interrupts" rather than being productive in their jobs.

We have a tremendous opportunity to benefit from standards. But we must start with real requirements analysis, continue with smart integration planning, and implement standards whenever they can help. We need to talk with other organizations to know what they are doing and cooperate so our solutions work together. Then we must dedicate experienced and properly trained support personnel so users can be users and not have to know anything about "how the engine works." We need to get better at *how* we do things and make those improvements in a cost-effective way so we can concentrate on producing the critical products our consumers need in today's complex world.

I'd like to thank the many, many people that I talked with throughout the Agency while preparing this presentation. Their input and perspectives were invaluable.

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Attachment

WHERE TO GO FOR MORE HELP (AS OF APRIL 1992)

UNIX questions   963-4052

Open Desktop (ODT)
  help   963-4052

   ordering   963-1515
   SA training classes   968-8007
   Ingres database support   963-1809
   DOS merge/DOS support   963-1515

PC/TCP Plus (ASTW XT/AT & 386s)   963-2003
  (licensing and support)

JSB Multiview Desktop (386s)
  demo   963-3091
  ordering   963-1515

PC XSight (ASTW AT & 386s)
  demo   963-3091
  ordering   963-1515

PC NFS information   963-3091
                                             963-1515

Office Portfolio support   963-3998

NETMAIL/NUAD support   963-3081

NUAD access utilities (Beta test)   963-1927
  (SMTP mail aliases)

SANDTERM   963-6324
  demos   963-4743

Domain Name Service (DNS)   963-5619
                                             963-5619

SID registration: send a mail message to netdir@▭, subject help. A message will be returned with instructions on how to register for an official SID.

NUAD registration: send a mail message to nuad@▭, subject help. A message will be returned with instructions on how to add yourself to the NUAD database.

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